

# **Building a Houston Hydrogen Hub: A Discussion with Hydrogen Council CEO Daryl Wilson**

February 18, 2021

# About the Center for Houston's Future

We bring business, government, and community stakeholders together to engage in fact-based strategic planning and collaboration on issues of great importance to the Houston region.



**Our areas of focus:**



**Strategic  
Initiatives**

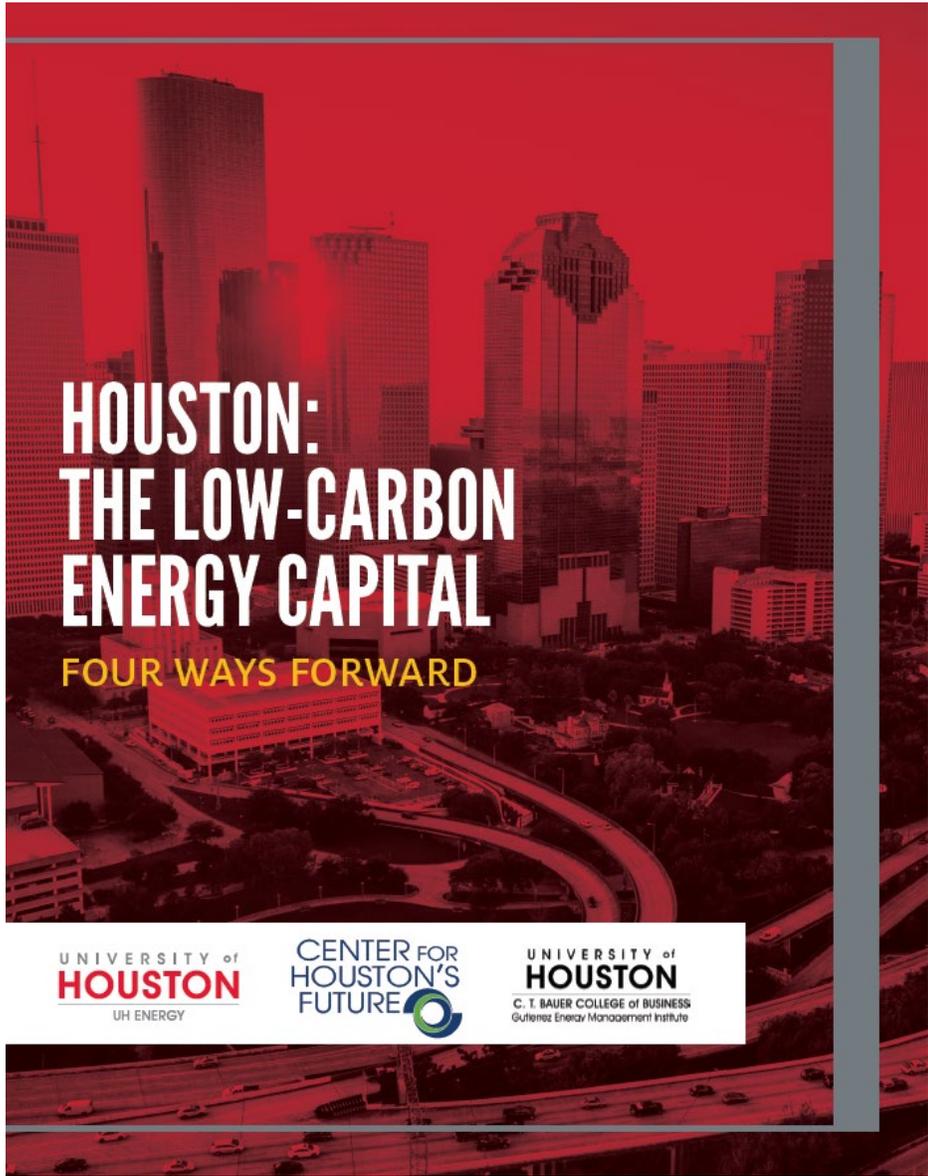


**Community  
Engagement**



**Leadership**





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Gutierrez Energy Management Institute





- **Hydrogen:** Being the center of the world's premier hydrogen system, the Houston area has the potential to create an entirely low-carbon hydrogen industry and become a major player in a \$T+ market - initially linking existing production with Carbon Capture, Usage, and Storage (CCUS) to bring at-scale volumes to market as clean, 'blue' hydrogen, while in parallel using its leading position in renewables to grow clean 'green' volumes
- **Carbon Capture:** Carbon management technologies could remove more than 12 million tons of emissions per year from the Houston region by 2030, taking advantage of the region's globally unmatched geologic capacity. CCUS will be a key enabler of other emissions-reduction strategies - including hydrogen, and renewables integration, low carbon petrochemicals manufacture.
- **Low Carbon Grid:** Texas is already the #1 wind producing state. And via its competitive market is positioned to additionally be a solar power leader and thereby accelerate decarbonization of its grid, creating potential low-cost production of green hydrogen, and synergies with hydrogen energy storage.
- **Circular Economy/Plastics Recycling:** Houston is uniquely positioned to substantially reduce carbon footprint by eliminating plastic waste through advanced recycling technologies, and by taking advantage of low-cost renewable energy and clean hydrogen in manufacturing plastics



Monday, February 15, 2021

HOUSTON'S BUSINESS INSIDER

# TEXAS INC.★

Shell  
Hydrogen



HOUSTON IS  
POSITIONED TO  
BECOME A LEADER  
IN HYDROGEN  
ENERGY

## Universe of Opportunity

**TOMLINSON** THERE'S MORE TO ECONOMIC LIFE THAN GDP  
**FINANCE** BOOM IN 'BLANK CHECK' FIRMS WEARS ON INSURERS

**“If you think of hydrogen as an industry, which we’re going to start to think about very soon, then we are one of the largest players not only in the U.S. but also one of the largest global players”**

**Texas Inc.  
February 15, 2020**



# Hydrogen is increasingly recognized as a key enabler to decarbonization, alongside renewable power adoption and electrification

## Examples of momentum for decarbonization



## Why Hydrogen?

**Versatile**

- Carrier
- Process heat
- Power conversion

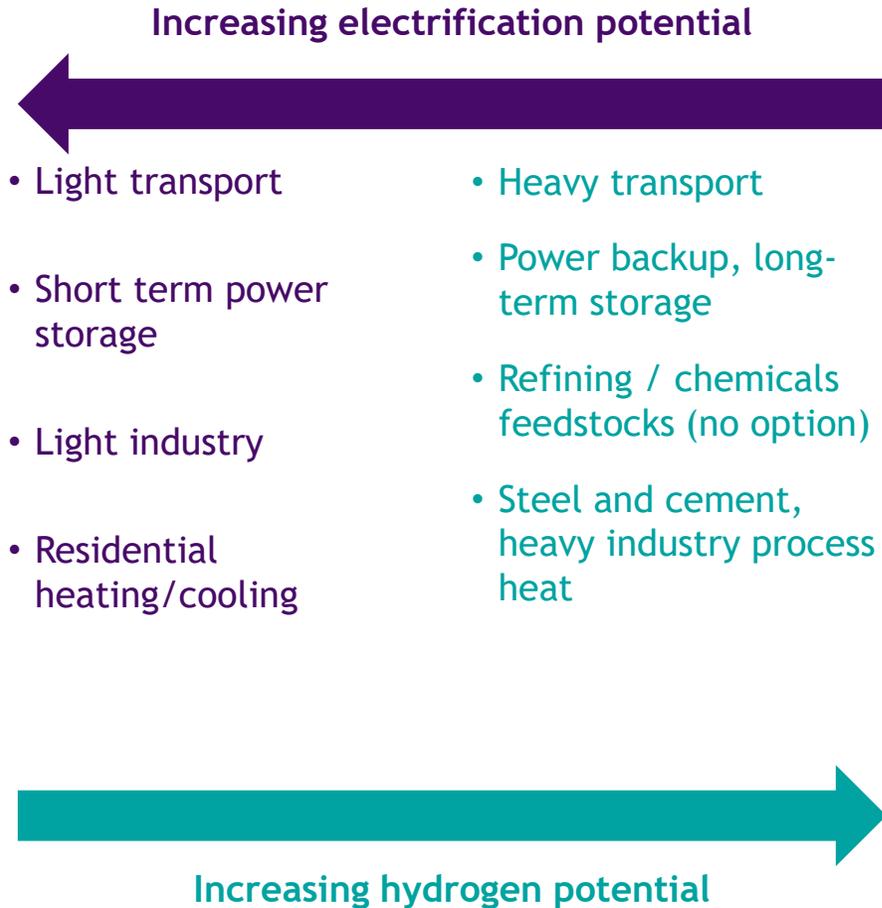
**Clean**

- Burning
- Fuel cell

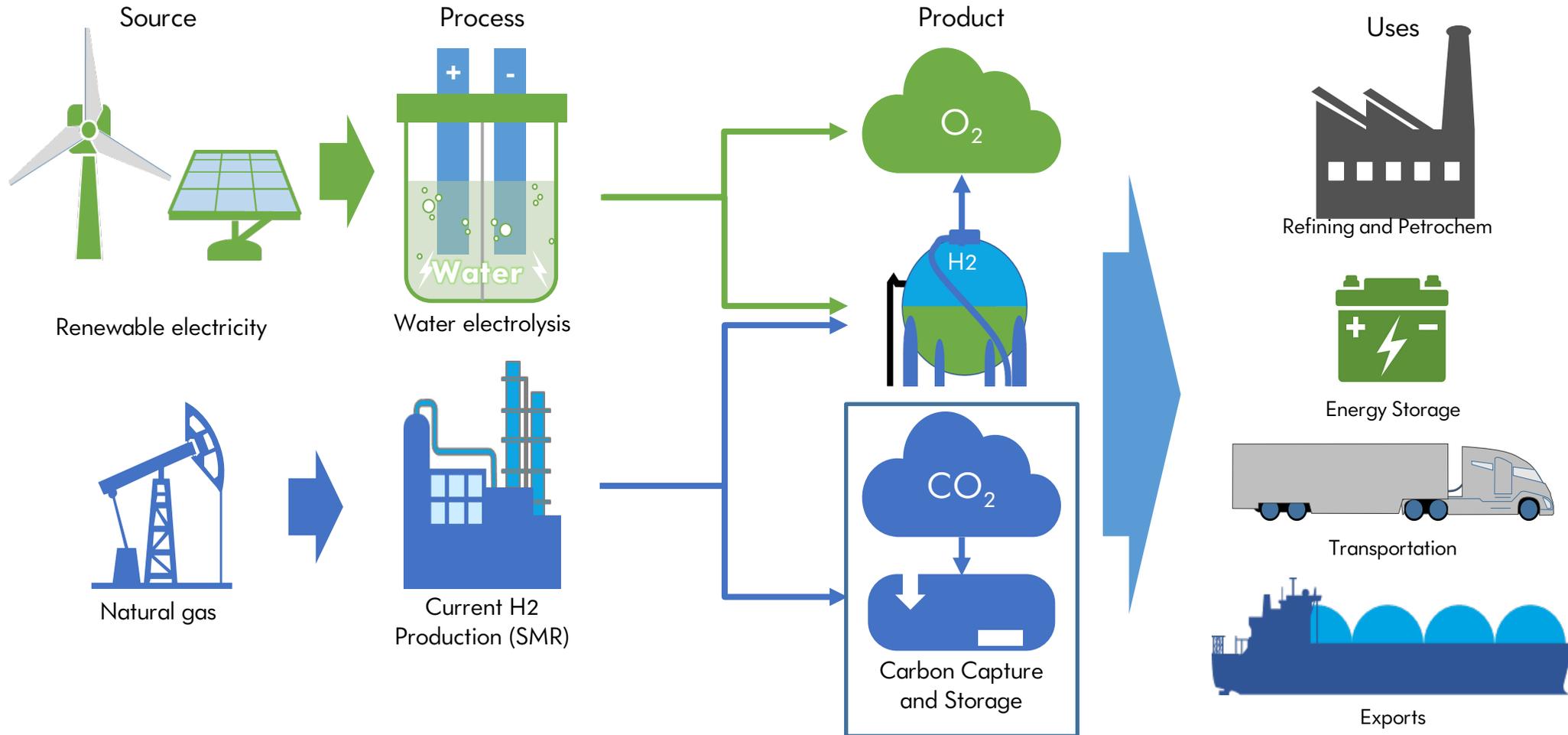
**Abundant, but**

- Plentiful
- Must manufacture transport, ship

## Unique hydrogen roles in decarbonization

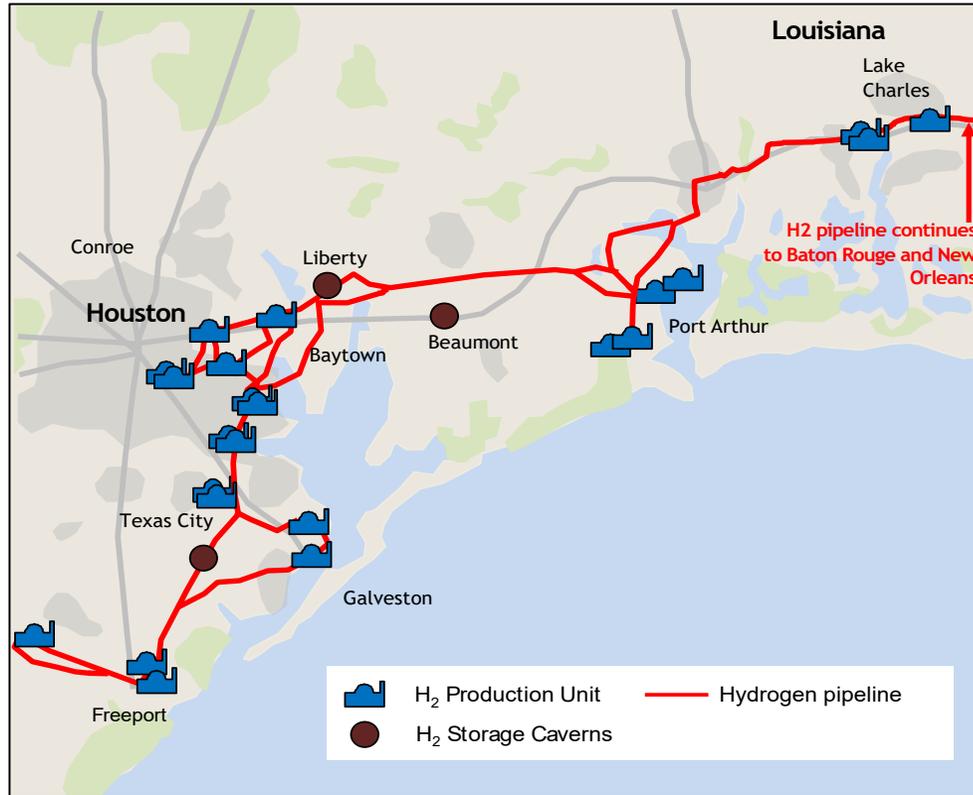


# Typical Hydrogen Production Options



# The Houston area anchors a world leading H2 system, with the key attributes to rapidly scale clean H2

## Existing hydrogen system in the Gulf Coast area



\*\* Existing H2 system could leverage in-place CCUS assets (e.g., Denbury pipeline) to readily add and scale CCUS to convert grey to blue H2

## TX Gulf Coast H2 system advantages<sup>1,2,3</sup>



Over 900 miles H2 pipelines (56% of US; 32% of global)



~3.4MMt of H2 produced annually largely through steam methane reformation (34% of US; 8.5x Rotterdam)



48 H2 production plants

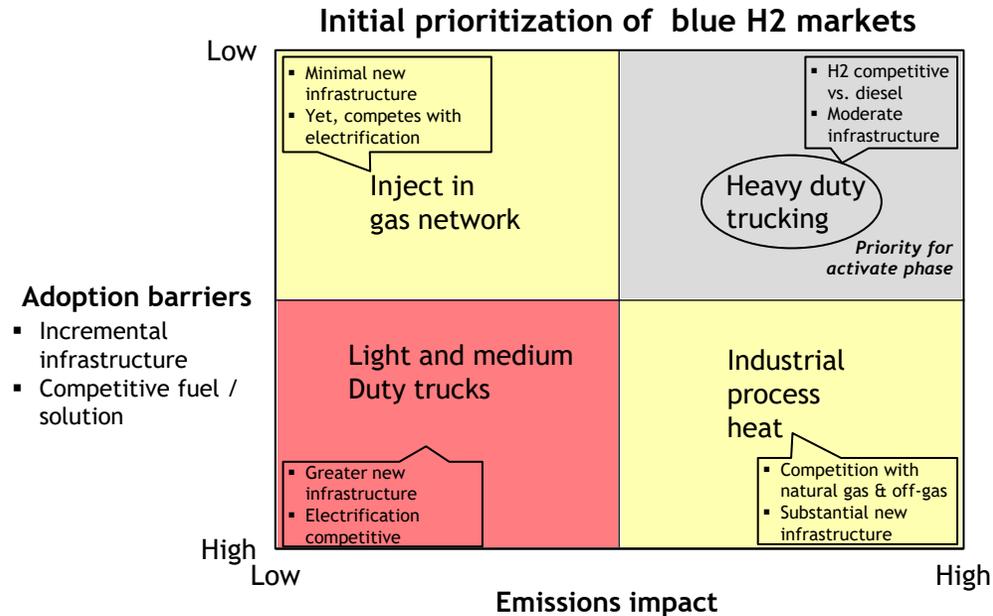


World's largest storage caverns for H2; adjacent to H2 network

Notes: (1) Houston MSA defined Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller counties; (2) TX Gulf Coast includes a region from Corpus Christi, TX to Lake Charles, LA; (3) Number of global H2 plants estimated by dividing global H2 production by US avg. production per H2 plant (52k tons H2 / year)  
Source: H2Tools; USDOT PHMSA - National Pipeline Mapping System; Seeking Alpha; Office of US Energy Efficiency & Renewable Energy; Hydrogen Europe



# New markets were prioritized based on relative adoption barriers (or advantages) and emissions impacts



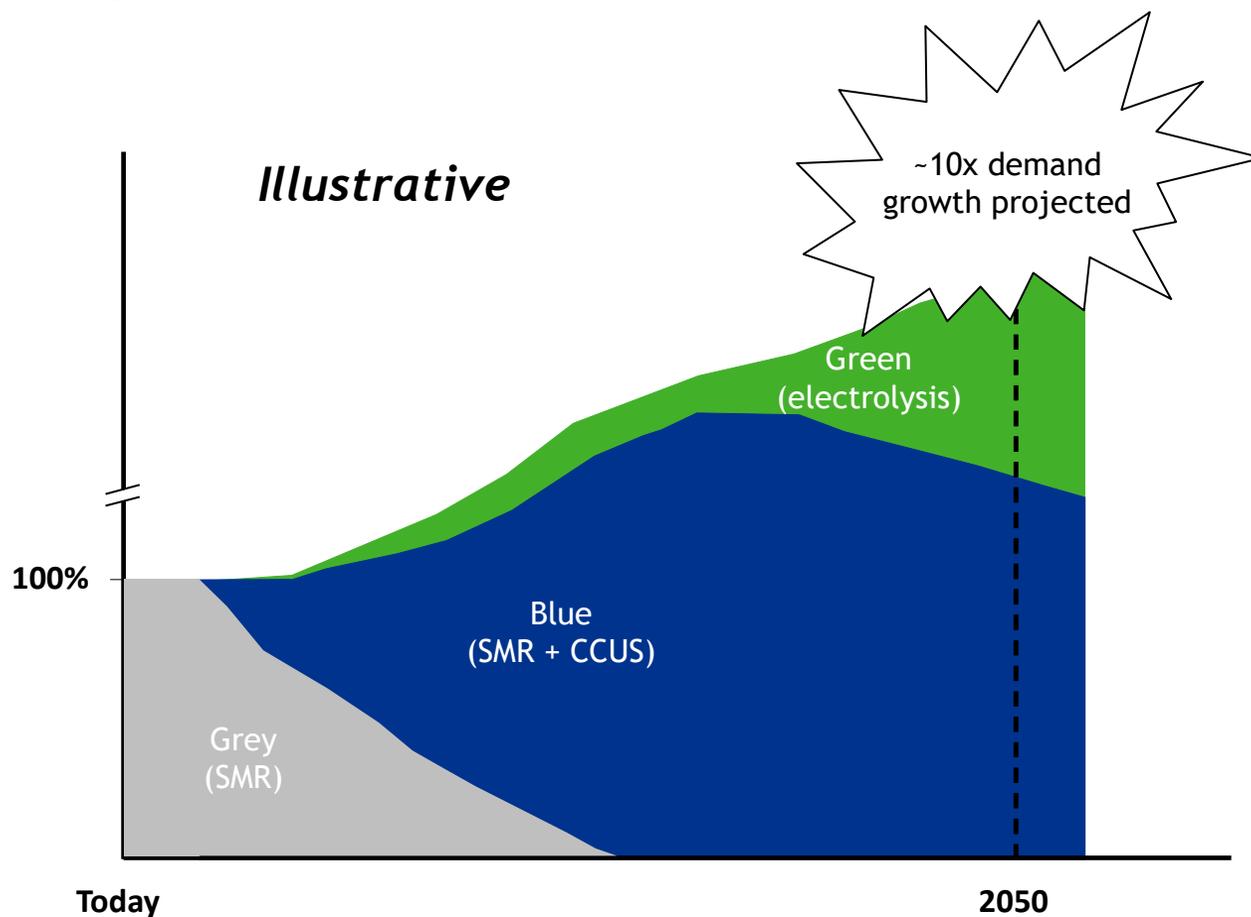
*“We see heavy hauling of freight as kind of like an anchor tenant in the hydrogen shopping mall.”*

- Program Lead,  
Canadian Energy Systems Initiative



# Strategies customized by region are emerging to capture the rapidly expanding hydrogen market opportunity

Hydrogen demand and mix over time



## Regional Hydrogen Strategy Drivers

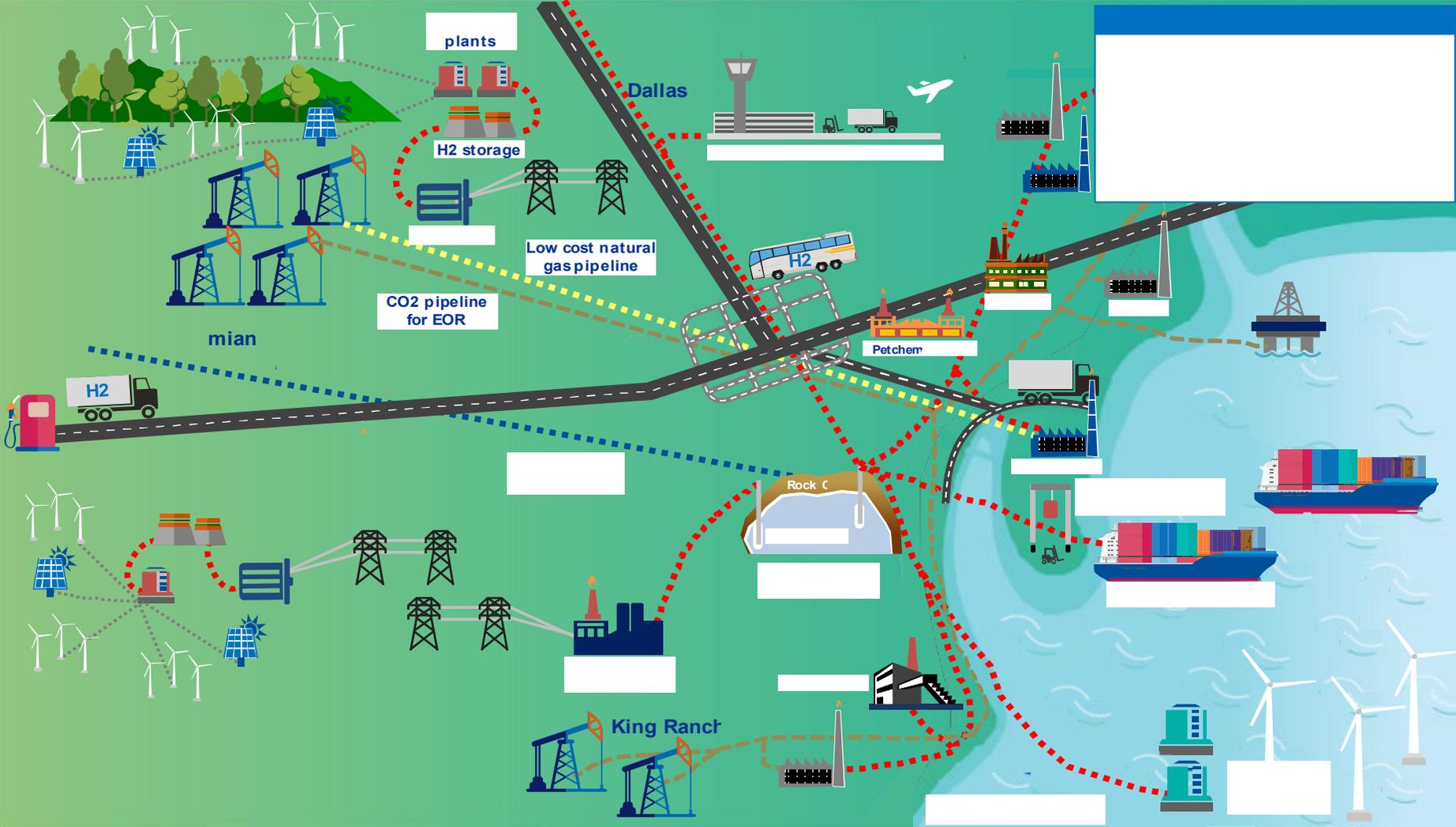
- Goals: 2050 net zero or similar
- Funding: Carbon fees or other
- Leverageable assets (blue)
  - H2 system
  - At-scale CCUS hub
- Leverageable assets (green)
  - Geologic storage
  - Low power prices

## Global Hydrogen Market Enablers

- Cost and supply chain improvements; e.g.,
  - Electrolyzers
  - Renewables
- H2 and renewable synergies



# Our Vision: A 'Houston Hydrogen Hub' integrating world leading infrastructure, market access, production advantages to bring accelerated, at-scale clean H2 volumes to multiple markets





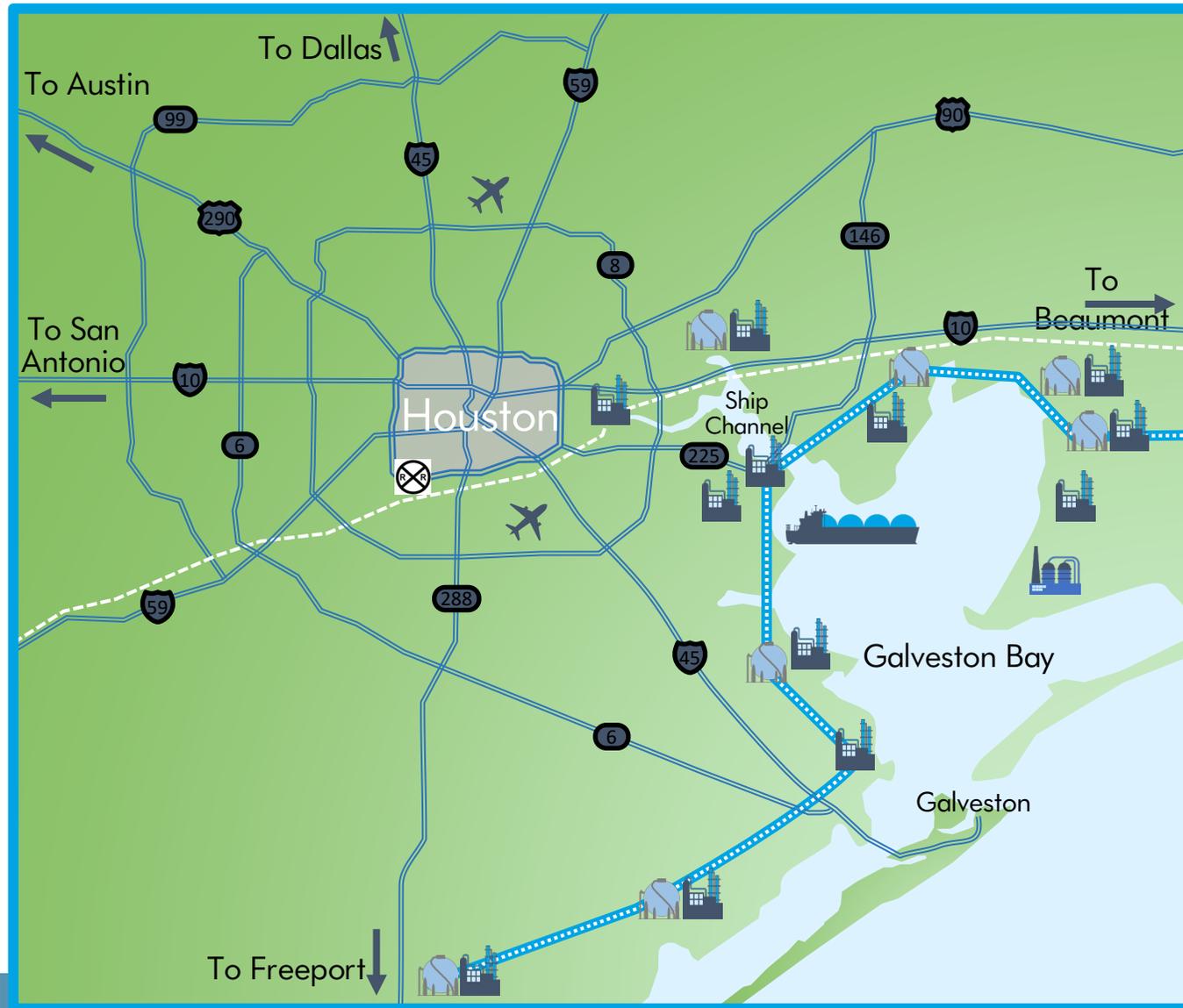
# Agenda

- Introductions (Via Chat)
- Short presentations on federal and state policies to support hydrogen development (5 minutes each)
  - Daryl Wilson, Hydrogen Council
  - Morry Markowitz, Fuel Cell and Hydrogen Energy Association
  - Randy Bell, Atlantic Council
  - Rob James/Meghan Hammond, Pillsbury
- Discussion Topics (5-7 minutes each)
  - What do you see as the major barrier that need to be addressed for Texas (and Houston specifically) to become recognized as leader in driving the adoption of hydrogen?
  - Please identify one or two federal policies that would accelerate the growth of hydrogen supply and/or applications?
  - Is there a role for state level policy?
  - What needs to happen to move forward on these federal and state policies issues?
  - How can the Center help?

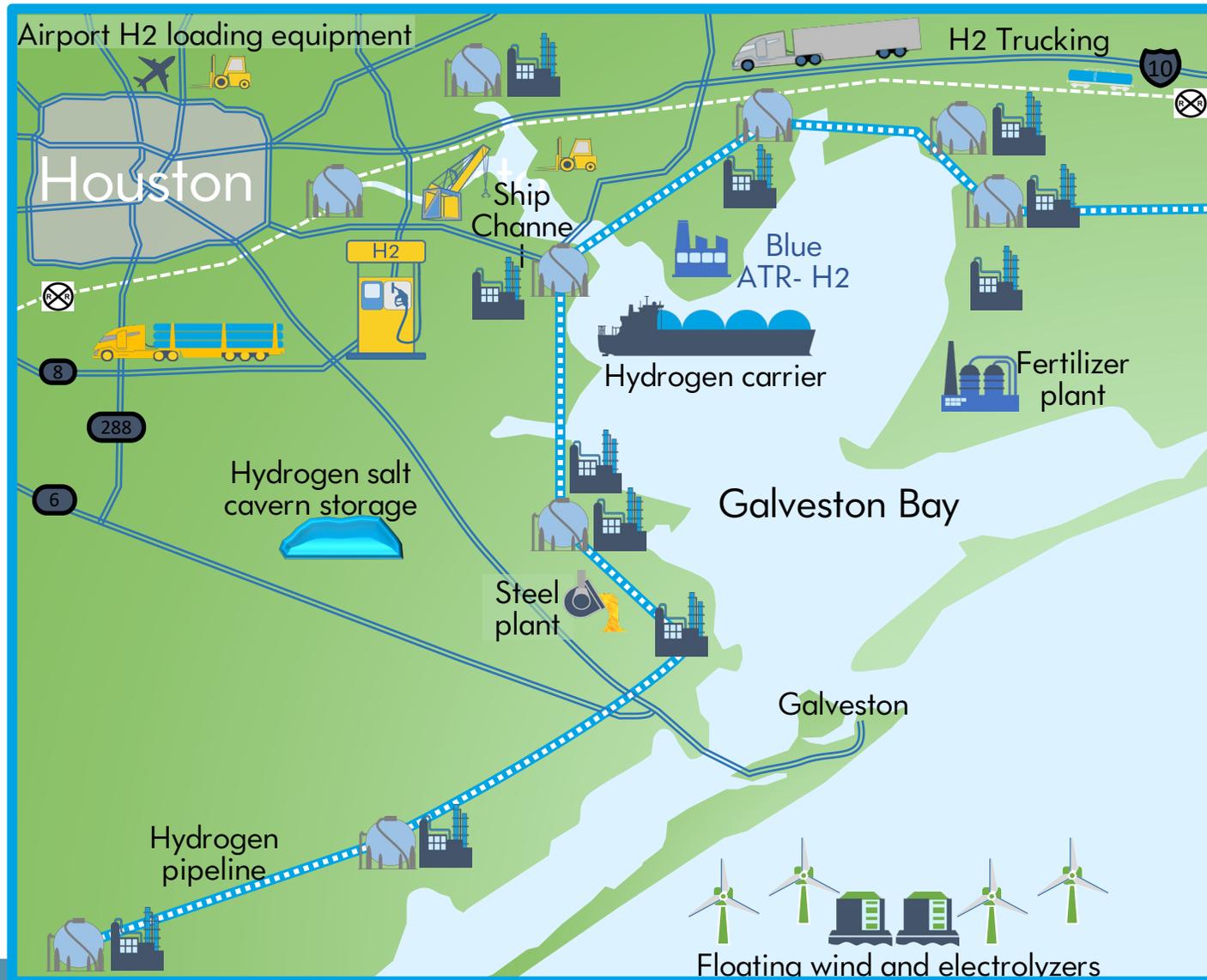




# Houston's Hydrogen Cluster – Today



# Houston's Hydrogen Cluster – Tomorrow



# Texas Low Carbon Energy Vision

